

Notes on the genus *Periphyllus* v.d. Hoeven (Hom., Aph.)

by

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The synonymy of the genus until 1920 is fully treated by Baker (1). It is, however, doubtful if the genus *Arakawana* Mats. from Japan is a synonym, which Baker believes. Also the characters by which he separates the genus from *Chaitophorus* Koch and related genera from Salicaceae do not hold. It is therefore necessary to look for other characters than those used by Baker.

The Anglo-American authors (1, 5, 13) separate *Periphyllus* from *Chaitophorus* by the shape of the cauda. In *Periphyllus* the cauda is said to be rounded, in *Chaitophorus* knobbed, i.e., consisting of a basal conical part and an apical globular part. As *Periphyllus granulatus* (Koch) has a knobbed cauda, this species from Acer would come in *Chaitophorus*, while some American species with a rounded cauda from Salix and Populus are at present placed in *Periphyllus* (5). It is more logical to suppose that the species from Acer and Aesculus form a natural group and those from Salicaceae another. And it is not difficult to find characters which prove this. In this way I come to the following subdivision of the tribe Atheroidini:

1. Subtribe *Atheroidina*. Living on Gramineae and Cyperaceae. Antennae always of 5 segments. Apterae viviparae with completely sclerotic tergum; larvae with scleroites; oviparae usually with the same, wholly sclerotic, tergum as apterae viviparae, with 8-shaped pseudosensoria on the hind tibiae. Cauda rounded or knobbed; rounded in *Atheroides* Hal., *Laingia* Theob., *Chaetosiphella* H.R.L., etc.; knobbed in *Sipha* Pass. and *Caricosipha* Börner.

2. Subtribe *Chaitophorina*. Living on Salicaceae or occasionally Betula. Antennae of 6, rarely 5 segments. Apterae viviparae nearly always with completely sclerotic tergum, very rarely, in underground forms, with a membraneous tergite with scleroites at the bases of the hairs. Oviparae always with a membraneous tergum, often with scleroites at the bases of the hairs, like the larvae. Pseudosensoria on hind tibiae of oviparae circular, without a much smaller central porus. Empodial hairs normally linear. Cauda knobbed in *Chaitophorus*, rounded in *Thomasiella* Strand.

3. Subtribe *Periphyllina*. Living on Aceraceae and sometimes Hippocastanaceae. Antennae almost always of 6 segments. Apterae viviparae never with wholly sclerotic tergum, but with more or less pigmented sclerotic plates at the bases of the dorsal

hairs, like the larvae. Oviparae with the same type of tergum, with the pseudosensoria on the hind tibiae circular with a distinct, very small, central, pit-like porus. Empodial hairs mostly broadly foliate. Cauda from broadly rounded to knobbed, *Periphyllus* v. d. Hoeven.

Börner (2) separates the *Periphyllina* from the *Chaitophorina* by the chaetotaxy of the new-born larvae; those of *Periphyllus* have, as I have verified, only 2 pleural hairs on the mesonotum (figs. 2, 3, 7, 8), those of *Chaitophorus* according to Börner 4—6, which I have not verified. Also in *Chaitophorus* the stigma of the wings is generally darker than the dusky margin along the subcosta; though it is sometimes dark in *Periphyllus* it is never darker than the border along the subcosta. By the sum of these characters the species from *Aceraceae*, etc., are distinguished against those from *Salicaceae* and this would seem to be correct, as the presence of the aestivating larvae in *Periphyllus*, also in *P. granulatus* (Koch) with a knobbed cauda, makes a sharp distinction between the aphids from both families of hostplants necessary.

Since Baker's paper a few new genera for aphids from *Acer* have been erected by Börner. In 1930 (2) he erects *Chaitophorinus*, type *Chaitophorus lyropictus* Kessler. He separates it from *Periphyllus* v. d. Hoeven by the presence in new-born larvae of pleural bristles from mesonotum till VIth abd. tergite (in my copy Börner added Vth or VIth tergite), a complete row of marginal hairs and by the absence of aestivating larvae; in new born-larvae of *Periphyllus* sensu Börner, 1930, pleural hairs are only present on the mesonotum and no marginal hairs are found on the VIIIth abd. segment, while aestivating larvae are present. I regret to say, that in the hundreds of new-born larvae of *lyropictus* Kessler, which I examined, pleural hairs were only present on the mesonotum, like in all the other species of *Periphyllus*. And, moreover, marginal hairs on the VIIIth abd. tergite are even absent in some of the *Periphyllus* spp., which have aestivating larvae (e.g., *P. testudinatus*, the genotype; *P. granulatus*). Apparently the only difference between *Chaitophorinus* Börner and *Periphyllus* v. d. Hoeven is the absence of aestivating larvae in the former genus, their presence in the latter, and therefore there is no reason to accept *Chaitophorinus*, which I consider a synonym of *Periphyllus*.

In 1940 Börner privately issued a small paper of 4 pages (3), consisting of very short descriptions of numerous new species and new genera. I will reprint the part relating to *Periphyllus* here, as the paper is very inaccessible.

"23. *Chaetophoria* n.g. Typus: *Chaetophorus xanthomelas* Koch. Fhlendgl. mit 1 langen und 1 viel kürzeren Bo. Si. stets, auch b. den Lv., vorhanden. Sommerliche Ruhelv. langbo. 8. Htlb-ring der Junglv. mit 4 Bo.

24. *Chaetophoria rhenana* n.sp. Weicht v. *Ch. xanthomelas* Koch (Spitzahorn) u. *acericola* Walk. (= *horrida* Theob.) (Bergahorn) durch geringere Grösse u. Ruhelv. m. 2-bo. oberer Afterklappe ab. Felsenahorn.

25. *Chaetophorella* n.g. Typus; *Ch. aceris* L. nec Koch. Weicht v. *Chaetophoria* durch Junglv. mit je 2 Rübo. am 8. u 9. Htlbring ab. Keine sommerlichen Ruhelv.

26. *Chaetophorella fusca* n.sp. Von *Ch. aceris* L. durch dunkelbraune bis schwarze Körperfarbe d. Ungefl. unterschieden. 5. Fhlgl. m. 4 (bei *aceris* m. 6—8) Bo. Feldahorn."

Chaitophorus xanthomelas Koch, originally described from *Lycium* (10), is the species which is generally known as *Periphyllus aceris* (L.), which lives on *Acer platanoides*. The characters of *Chaetophoria*, given by Börner, are correct, but also in *P. granulatus* (Koch) the last ant. segment has a long and a short bristle, and siphunculi are present in all its larvae, the foliate-haired aestivating larvae inclusive. The only difference from *Periphyllus* v. d. Hoeven is the presence of the long-haired aestivating larvae and the 4 hairs on the VIIIth abd. tergite in new-born larvae in *Chaetophoria* Börner. This difference, the only one, seems too small to justify the erection of a separate genus and therefore I consider *Chaetophoria* Börner a synonym of *Periphyllus* v. d. Hoeven.

Linné describes *Aphis aceris* extensively in *Fauna Suecica* (11). According to this description his species is certainly a *Periphyllus*, but it is more difficult to decide which species it is. The colour-pattern, which Linné describes, is that known from *P. lyropictus* (Kessler), the only European species without aestivating larvae. It is evident, that Börner (3) wants to replace the name *lyropictus* Kessler by *aceris* L. But if *aceris* L. is the same as *P. lyropictus* (Kessler), then *Chaetophorella* Börner, 1940, is a full synonym of *Chaitophorinus* Börner, 1930, type *lyropictus* Kessler!! As we saw this genus is not acceptable.

There are, however, some objections against Börner's hypothesis about *aceris* L. In the first place the abdominal ornamentation which Linné describes occurs in some forms of most *Periphyllus* spp., and Linné does not say when he observed his aphids. Also the species generally known as *P. aceris* (L.) often has this ornamentation in the spring. Another objection is more positively against Börner's opinion. Because Linné described *aceris* in *Fauna Suecica* it must be a Swedish insect, even a common Swedish insect. But never has *lyropictus* (Kessler) been (re-) found in Sweden, and Wahlgren (15) does not mention this species in his very extensive list of Swedish aphids, though he deals with a number of rare and very hidden species. This makes it very unlikely that Börner is correct in identifying *lyropictus* (Kessler) with *aceris* L. and I will gladly stick to the current opinion that *aceris* L. is the species with long-haired aestivating larvae.

After this discussion of the characteristics and the synonyms of *Periphyllus* v. d. Hoeven, we want to submit the European species to a short examination. For in the more recent literature till 1940

only 3 species are described, while there are several more, of which also the biologies have been investigated more fully. And no good characters by which to recognize the species are published, so that even very common species often are incorrectly identified.

1. *Periphyllus lyropictus* (Kessler). A common species on *Acer platanoides* and *A. campestre* (see p. 240), of which the larvae and apterae are pale yellowish green, with a rectangular dark green, to brown spot on the thorax and Y-shaped, greenish to brown mark between the siphunculi, with the arms of the Y curving in front of the siphunculi, down the flanks. In old specimens the body becomes wholly mottled brown. Alatae with the abdomen yellow to blackish brown, in pale specimens with a series of very short transverse stripes in dark brown along the dorsum, which in dark specimens are not visible. In cleared, prepared apterae viviparae the cauda appears to be rather long, almost as long its basal width (fig. 1); sclerotic plates around the bases of the dorsal hairs can usually be hardly seen, as they are but seldom pigmented, and all the hairs are very long, with long, very acute apices. The last ant. segment bears one extremely long hair and one short hair, the processus terminalis is 4—5½ times as long as the base of the segment, and often as long as the IIIrd segment. The siphunculi are always brownish pigmented, while the legs are little pigmented. In cleared alatae a line of very short, spinal transverse sclerites, brown in colour, along the abdominal dorsum is very conspicuous, and their tibiae are totally dark, darker than any part of the femora, a character also occurring in the American *P. negundinis* (Thomas), according to material received from and identified by Mr. Strom.

The biology was described by Kessler (9). The fundatrix develops and stays on the bark of one-year old branches. The second generation, mostly completely apterous, rarely with some alatae, develops on the undersides of the leaves, as soon as the buds open. The 3rd generation is partly alate and later alate forms are exceedingly rare. The summer generations, up to 10 in number, live on the undersides of the leaves, along the main veins, in small groups. The insects are typically gregarious; the alatae, colonizing a new leaf or tree, often collect at the same spot and sit with their heads almost touching, depositing their offspring. Always the colonies are very compact. In the autumn apterous mothers produce oviparous females and alate males, and the former, after fertilisation, lay their eggs on the wood of the branches. The colonies are usually attended by ants (*Lasius* spp.) during the summer. All this according to my own observations in the Netherlands, which agree with most of Kessler's data.

2. *Periphyllus testudinatus* (Thornton) (14). This is the genotype of *Periphyllus*, also described by my compatriot J. v. d. Hoeven in vol. VI of this Journal (8) under the name *Periphyllus testudo*. The older authors described this species from the aesti-

vating larvae, which as the names indicate, and fig. 2 shows, have a tortoise-like pattern of sclerites on the abdomen. The species has often been confused with the next one, at least its mature forms. For the character, by which it is usually separated from

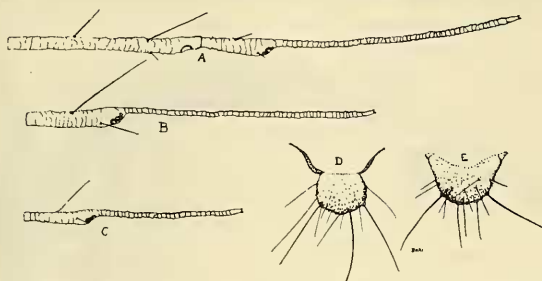


Fig. 1. A. *P. testudinatus* (Thornton) Vth and VIth ant. segment of alate female.
 B. *P. aceris aceris* (L.), VIth ant. segment of alate female.
 C. *P. aceris acericola* (Wlk.), idem.
 D. *P. granulatus* (Koch), cauda of aptera vivipara.
 E. *P. lyropictus* (Kessler), idem; all 78 \times magnified.

aceris L. is not very reliable. All the mature forms and also the normal larvae of this European species can be recognized by the presence on the base of the last ant. segment of two hairs of which the longest is little longer than the largest diameter of the last segment. Apteræ in life are dark green or brown to black, with 4 series of blackish tubercles down the dorsum; the legs show distinct, blackish knees, with the bases of the femora and the middle parts of the tibiae pale yellowish, greenish or pale brownish. Alatae look greenish black or brownish black, with black head and thorax. Macerated apteræ can easily be recognized by the rather large sclerites at the bases of the dorsal hairs; these are blackish pigmented, and often those of the duplicated spinal hairs are fused to small, paired sclerotic plates with a few hairs each. The pigmentation of the legs is also typical, as the middle portion of the tibiae and the basal half of the femora is quite pale, but the femora distally and the tibiae at both ends dark to blackish. The cauda is broadly rounded. The siphunculi are black. The first tarsal joints have usually only 5 hairs, while most of the other species have nearly always 7 hairs there. Macerated alatae show long, spino-pleural transverse sclerites which are blackish pigmented across the dorsum of abdomen, and also narrow sclerotic transverse stripes ventrally. The IIIrd ant. segment shows 14—32 rhinaria, irregularly spread along one side, more than alatae of other species in Europe usually have. The legs are similarly pigmented as in the apteræ, but with more black. Both apteræ and alatae usually contain embryos with foliate marginal hairs, the

aestivating larvae (fig. 2). These, when born, are greenish, later with only the head and thorax or completely pale brownish. 4 frontal hairs, the posterior marginal hair of the meso- and metathorax, all the abdominal marginal hairs and also the spinal hairs of the VIIth and VIIIth abd. tergite are broadly foliate, mostly with roun-

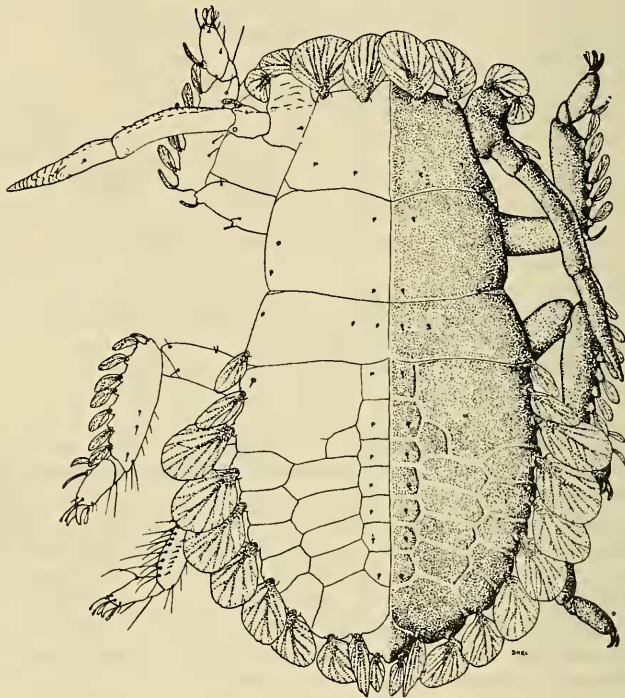


Fig. 2. *P. testudinatus* (Thornton), aestivating larva, right half to show pigmentation in life, grey = green in life, white = colourless; left half after clearing, 113 \times magnified.

ded apices, and provided with a sort of nervature of colourless, thickened chitinous lines, so that the name foliate hairs is quite appropriate; the other dorsal hairs are very short and inconspicuous; their arrangement is like that in normal larvae in this genus (e.g. fig. 8). Also the basal ant. segments and the fore and middle legs possess foliate hairs on one side, normal hairs ventrally, while the hind legs have long, normal hairs. The dorsum is divided in a tortoise-like pattern of sclerotic plates; in life the body underneath the plates is green (grey in the figure, right half), while the lines between them (white in the figure, right half) are colourless. Siphunculi are absent or only visible as traces. The

processus terminalis, or rather the part of the last ant. segment past the primary rhinaria, is not longer than the basal part of the segment. The cauda lies under the body and bears 2 hairs, seldom 1 more. Larvae with normal hairs, sometimes found with those with foliate hairs in the same mother, have the same structure as those of *P. granulatus* (Koch), fig. 8, but there are some specific differences in the length of hairs and ant. segments.

Also of this species Kessler (9) studied the biology, while more details have been added by Rymer Roberts (12). I can confirm their results. According to my observations the fundatrix develops like that of the preceding species, but on various species of *Acer*. The second generation is a mixture of some apterae, many alatae and a number of more or less alatiform forms without wings. All these forms produce the curious aestivating larvae. When these are born, they walk away and select a more or less concave spot on the underside of the leaf or on the upper-side of a vein. They there remain motionless, do not grow and evidently demonstrate a distinct diapause, which lasts till the autumn, the second half of September, or does not end at all, so that the leaves drop with the living aestivating larvae on them. But most of them show growth in September, they shed their skin and emerge as normal, long-haired larvae. These develop into apterous mothers, which produce the oviparous females and alate males. In the same way as by the preceding species winter eggs are laid. According to this simple scheme there are 4 generations in a year. But often there are more. For according to Rymer Roberts not all the larvae produced by the 2nd generation are aestivating larvae. Some females, according to my observations especially apterous females, produce only or partly larvae with normal hairs, which have no diapause, but soon develop into apterae or alatae. And these again can give birth to either or both aestivating larvae and normal larvae, etc. On suckers and tender growth generally few or no aestivating larvae are formed and a continual series of generations develops as in *lyropictus* (Kessler), till here also in the autumn sexuparae, sexuales and eggs are produced. Rymer Roberts has given a good account of these lines parallelous to the aestivating line and he also states, that sometimes the sexuparae developed from aestivating larvae, can produce viviparous females instead of sexuales, which is another complication. During summer probably all species of *Acer* (Negundo included) and some species of *Aesculus*, upon all of which aestivating larvae are deposited, serve as hostplants.

3. *Periphyllus aceris* (L.). Under this name a species from *Acer* spp. is understood, which has long-haired aestivating larvae (fig. 3). This conception will have to be narrowed down to a form from *Acer platanoides*, as apparently each *Acer* has its own subspecies. I choose *Acer platanoides* as typical host, because the related subspecies from *Acer pseudoplatanus* and *A. ? monspessu-*

lanus have already fixed names. The species shows the following characters. Apteræ in life yellowish to pale greenish, sometimes with short, thick brown transverse bars across the middle of the dorsum or an indistinct green pattern. Siphunculi colourless. Sometimes, particularly in the spring a green to brown subcutaneous

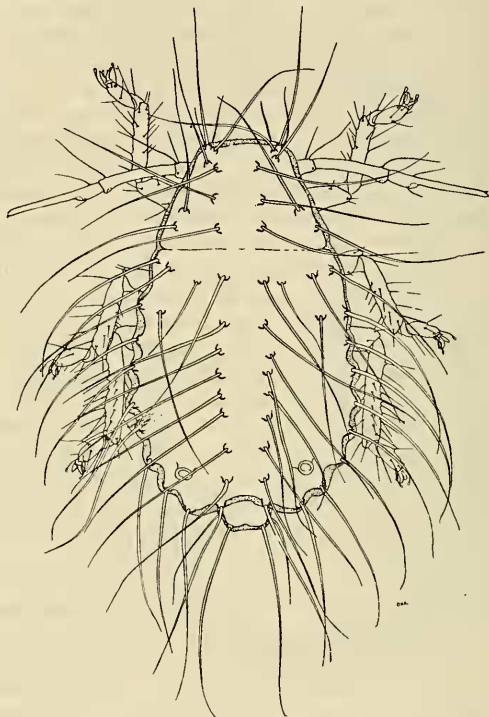


Fig. 3. *Periphyllus aceris* (L.). Aestivating larva, dorsally ;
waxy layer grey, 78 \times .

colourpattern like that of *P. lyropictus* (Kessler) develops. Legs remarkably pale, colourless. Alatae with black head and thorax, the abdomen either pale yellow or greenish with dark transverse stripes across dorsum. Siphunculi dark to black. Legs conspicuously pale. Wings with the stigma and a zone along the subcosta dark. Macerated apteræ sometimes have brown sclerotic spino-pleural transverse bars on the middle of abdomen, but usually they are not pigmented. The siphunculi are colourless. The cauda is very broadly rounded. The dorsal hairs have normal apices, at least not blunt or furcated ones. The last ant. segment has one long and one much shorter hair, the longest one several times as long as the largest diameter of the segment, which is a good and easy

character for distinction from *P. testudinatus*, as all forms show it; the processus terminalis is not more than 3 times as long as base of VIth segment, often much shorter. Alatae have the same sclerotic pattern as those of *P. testudinatus*, but they lack the ventral sclerotic bars on abdomen. Their legs do not show the black knees of *testudinatus*, but are sometimes completely pale and at most show the distal part of the hind femora brownish while those of the other femora are hardly darker than their bases. The tibiae are pale with slightly darker apices. The antennae are like those in apterae, but the processus terminalis may be up to 4 times as long as base of VIth segment, though usually much shorter; the IIIrd segment bears 3—16 rhinaria, often in a line and often on basal half of the segment. The species has often been confused with *testudinatus* (Thornton), because the characters used for distinguishing them do not completely hold, cfr. (13).

In early summer the apterae and alatae usually contain larvae with very long hairs and with siphunculi. These larvae, when born, are yellowish white and gather in close patches, the outer ones with their heads directed to the centre of the patch and the marginal hairs of all the specimens mutually touching¹). They show the following characteristics. Body flat and broadly pyriform, dorsally and marginally covered with extremely long, curved hairs, some of which are found also on the antennae. Other hairs rather short and inconspicuous. The VIIIth abd. segment, which is somewhat trapezoid in shape (fig. 4), bears 4 hairs, of which the two marginal ones are much shorter than other dorsal and marginal hairs. The siphunculi are prominent and of essentially the same shape as those in normal first instar larvae in this genus. The whole body is marginally and possibly also dorsally enveloped in a water-clear, homogeneous layer of a waxy substance, which becomes distinct when the insects are slowly heated in 10 % KOH under the microscope; then the layer looses hold.

As is evident from the part quoted from Börner's paper of 1940 (3), no. 23 and 24, there are different forms on different species of *Acer*, which all agree with the description given above. Börner considers them species, but as the mutual differences are so very small I would rather treat them as subspecies of the species *aceris* (L.). I have not found or examined the species *rehnana* Börner and therefore must confine myself to those of the subspecies which I could study in the Netherlands. There is one on *Acer platanoides*, which I call *Periphyllus aceris aceris* (L.), and one on *Acer pseudoplatanus* which I name *Periphyllus aceris acericola* (Wlk.). Probably the species, described in this paper as *lichtensteini* nov. spec., also belongs to *aceris* sensu latiore, and it may even be the form described by Börner as *Chaetophoria*

¹) The behaviour and long diapause of these larvae was first described by Walker (16).

thenana, but this cannot be decided at present. The biology is described for each of the subspecies separately, as they differ in this regard.

a. *P. aceris aceris* (L.). Apterous viviparous forms found in early summer are rather bright pale yellow, with sometimes brownish of green transverse bars on the middle of the dorsum, or a faint pattern in green or brown as described for apterae of *P. lyropictus* (Kessler). Their legs are quite pale. The siphunculi and cauda and also the basal part of the antennae are almost colourless, the apex of the Vth segment, base of VIth and processus terminalis are brownish. Alatae are yellowish, with blackish brown head, thorax and transverse bands across abdomen. Legs uniformly pale, only the apices of the tibiae dusky. Macerated apterae sometimes with short, broad, transverse bars on abdomen, which are brown-sclerotic. Legs quite pale, even uniformly so. Also in macerated alatae the legs are evenly pale, with only the apices of the tibiae slightly brownish. Both forms have a cauda with more than 20 hairs of various lengths, and the shortest of the 2 hairs on VIth ant. segment reaches well past the accessory rhinaria (fig. 1). Their body is large, usually well over 3.5 mm long.

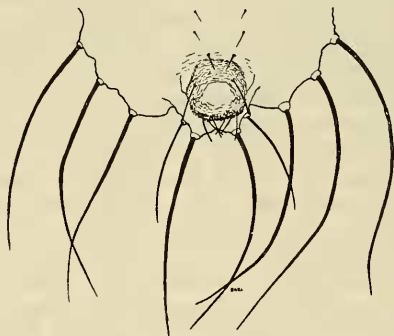


Fig. 4. *P. aceris aceris* (L.), caudal part of aestivating larva, ventrally 114 \times .

The aestivating larvae often form their patches near the acute apices of the leaves. They are easily recognized by having spoon-shaped or broadly spatulate apices to the latero-apical hairs of the second tarsal joints, while also the hairs on the empodium are flattened and broadened towards their apices (fig. 5; 6, left); the cauda (fig. 4) has normally 6 hairs in 3 pairs, but sometimes one or two of these hairs are wanting.

The biology is well known. Data have been provided by Walker (16), Kessler (9) and Rymer Roberts. (12)¹⁾ It is, however, evident, that confusion with *P. aceris acericola*

¹⁾ It is not clear to which subspecies their data relate.

Wlk. has occurred, which makes it necessary to reexamine the biology. According to Rymer Roberts the biology of this species is identical with that of *testudinatus* (Thornton), and the same parallel lines occur. This means, that the fundatrices develop on the youngest branches, that the second generation produces

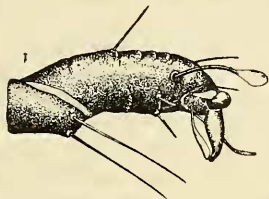


Fig. 5. *P. aceris aceris* (L.) 2nd tarsal joint of aestivating larva in latero-ventral view, $\times 363$.

aestivating larvae, which rest till the end of September and then grow into the sexuparae, which in their turn produce egg-laying females and alate males. Some offspring of the 2nd generation ought then to produce normal larvae without diapause and there should be a parallelous series of generations through the summer. Although I have studied the biology of this and the other subspecies in many years since 1930, I have never seen a trace of parallelous series in this subspecies. According to my observations on *Acer platanoides* both the apterae and the alatae of the 2nd generation produce only aestivating larvae and then the viviparae did not turn up again before the aestivating larvae reached maturity, in September, or later. In the Netherlands at least, it would seem that this species lives strictly according to the rules for its biology as set by Kessler, without parallelous lines. I made some small experiments on the behaviour of the aestivating larvae, as I wanted to know whether their sitting in patches was merely caused by them remaining on the place where they were born or by other factors, such as mutual thigmotaxis or special preference for certain places on the surface of the leaf. From small potted *Acer platanoides* with 4—6 leaves I killed the leaf on which the larvae sat, without removing it. They then started to walk about, walked over the petiole and reached another leaf, where no larvae were present. Here at first most of them sat isolated, but after one or two days they all had formed a number of compact patches of the customary arrangement. After disturbing them now and then, the patches split up and the larvae walked about, only to form new patches or a new patch. From the various places where they grouped together it would seem as if their grouping is not caused by certain places on the leaf which form a common attraction, but by an instinctive gregariousness, such as I also mentioned for the alatae of *P. lyropictus* (Kessler).

b. *P. aceris acericola* (Wlk.). Since Walker (16) described this form it has not been mentioned in the literature until Börner, 1940 (3). It has evidently often been mistaken for *P. aceris aceris* (L.), as most authors mention *aceris* with long-haired aestivating larvae from both *Acer platanoides* and *A. pseudoplatanus*. Though both subspecies are similar, they can rather easily be distinguished, also their aestivating larvae.

Apterae viviparae of the 2nd generation are not always found. They are rather uniformly pale greenish, with some brighter green ornamentation, with pale legs, siphunculi and cauda. The alatae are often very common on *Acer pseudoplatanus*, and it is this form which Walker described. They have a black head, thorax and abdominal dorsal transverse bars, and the remainder of their abdomen is not yellowish as in *aceris sensu stricto*, but pale green. The legs are in life remarkably pale. Otherwise they are very much like the preceding subspecies, but smaller, under 3.50 mm long. Macerated apterae of the second generation I have not examined; my material was destroyed in 1944. Cleared alatae are very similar to those of the subspecies *aceris* (L.), but their legs show the distal parts of the femora, particularly the hind femora more or less brownish. The cauda has less than 20 hairs. The shortest hair on VIth ant. segment reaches not or hardly past the accessory rhinaria (fig. 1) and the processus terminalis is on the average shorter compared to both the IIIrd ant. segment and the base of VIth segment. The aestivating larvae differ from those of *P. aceris aceris* (L.) in the shape of the hairs on the second tarsal joints; in this subspecies the latero-apical hairs have the very apices flattened, a little curved and very little enlarged, rarely as much as shown in fig. 6; the empodial hairs are linear; normally the cauda has only 4 hairs, but occasionally 5 may be present, though this is rather exceptional.

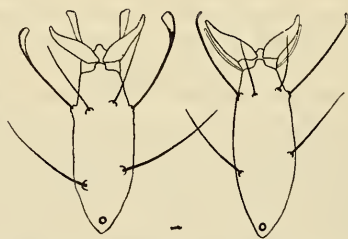


Fig. 6. Left: *P. aceris* (L.), 2nd tarsal joint dorsally. Right: *P. aceris acericola* (Wlk.), 2nd tarsal joint dorsally, 360 \times .

No special publications on the biology of this subspecies seem to exist. There are only small differences from that of *P. aceris aceris* (L.). The second generation is frequently completely alate. The aestivating larvae live in patches on the underside of the

leaves, usually more in the middle of the leaf and less near the ends of the main veins. Their behaviour is the same as that of *aceris* sensu stricto, but they differ in the stability of their diapause. For in *acericola* often some of the larvae already a few weeks after birth start growth and develop into apterous mothers, which then are not sexuparae. In such a case usually all the larvae of a group develop at the same time and one finds a patch of mature apterae as a result. Other patches on the same tree, however, often remain dormant, and apparently those on the oldest leaves of a branch stop their diapause earlier than those on younger leaves of the same branch. Since old leaves are drier than younger ones, I tried to break the diapause by not watering small potted trees with aestivating larvae for some time. This worked well, for after a week the aestivating larvae on the dry trees had all moulted, those on the other trees not. I could not achieve this with aestivating larvae of *P. aceris aceris* (L.) on potted *Acer platanoides*. Then nothing happened on the dry plants, except that the larvae became restless and dispersed; no moulting was seen until now, the middle of August.

The further biology is like that of *testudinatus*, but parallelous lines I did not find. The sexuparae may belong to the 3rd—6th generation.

c. *P. aceris rhenana* (B ö r n e r). I have not seen this species or subspecies and have failed in finding out what B ö r n e r means with „Felsenahorn“, the hostplant (3). For according to Gerth van Wijk,¹⁾ „Felsenahorn“ is the German name for *Acer saccharinum*, an American *Acer*, and it looks very improbable that a separate species of *Periphyllus* should live in Europe on this tree, while no species with long-haired aestivating larvae are known from North America. The vulgar name *rhenana* given by B ö r n e r and the name „Felsenahorn“ may suggest that B ö r n e r means the species *Acer monspessulanus*, which has an area of distribution extending from the West into the Rhine and Moselle area of Germany, and from which *aceris* L. was recorded. According to B ö r n e r, see p. 226, the species has the characters enumerated for *Periphyllus aceris* (L.) sensu latiore and differs from the other two subspecies by being smaller. Its aestivating larvae are said to have 2 caudal hairs and if this is always so, they can be easily distinguished from those of other subspecies, which have at least 4—6 caudal hairs in all their larvae. It is not impossible, that the oviparae and males, described below as *P. lichtensteini* nov. spec. are those of B ö r n e r's *rhenana*, but his fragmentary description makes identification impossible.

4. *Periphyllus granulatus* (Koch). Since Koch (10) described and figured this species it has not been mentioned in the literature.

¹⁾ Gerth van Wijk, L. L., Dictionary of Plant Names, Den Haag, M. Nijhoff, 1911.

It is this species which I described as *P. templi* nov. spec. (7), when I received pickled material collected in Engeland. Recently I have found it in large numbers in the Netherlands and now it can with great certainty be identified with Koch's species. According to Koch the insects are evenly green and they live along the flowerstems of *Acer campestre*. This is quite correct, and typical for the species. I have material from England, Netherlands and Italy, so that evidently it occurs all over Europe, but it is not common.

Living apterae are evenly apple-green in early summer, more mottled after the middle of July. The legs, siphunculi, cauda and antennae are concolorous with the body. The body is flattened and pyriform, with narrow head and thorax, about 2—3 mm long. Macerated apterae look very much like those of *Periphyllus lyropictus* (Kessler). They differ in the shape of the cauda, which is distinctly knobbed in *granulatus* (fig. 1), the pigment-less siphunculi, and the forms taken in early summer also by the fact, that most of the dorsal hairs have either blunt, acuminate, rounded, or in

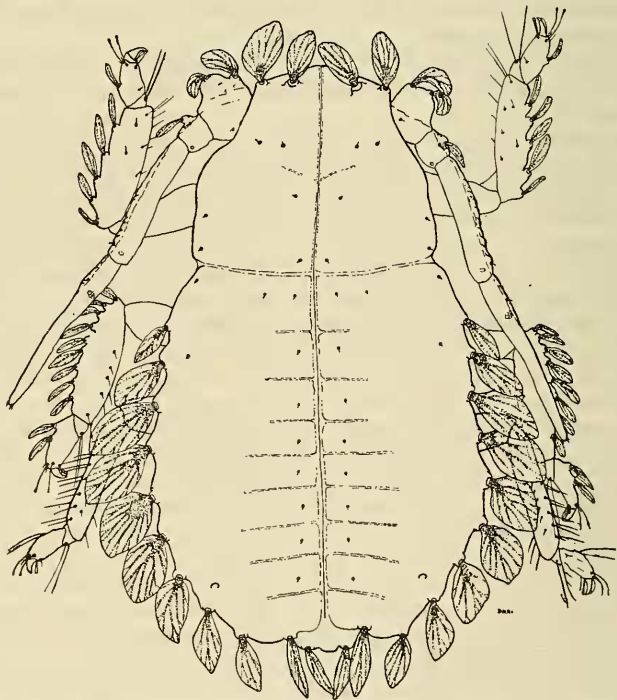


Fig. 7. *P. granulatus* (Koch). Aestivating larva, macerated, 114 X.¹⁾

¹⁾ Through inaccurate block-making the chaetotaxy of the right-side hind tarsus is incorrect.

the shorter hairs enlarged, flattened and serrate apices; this character disappears more or less in later generations and then the shape of the cauda is the best available. Though thousands of apterae were seen, no nymphs with wing-pads or alatae were observed; this form seems to be uncommonly rare in this species¹).

When examining a number of apterae in the end of May, I found embryos with foliate hairs in a number of them. I then went to the tree where I had collected them and soon found the aestivating larvae there also. They show a distinct preference for the wings of the fruit, where they sit between the veins and also near the swollen base containing the seed. Some were also found on the upper-sides of the leaves, more rarely on the undersides. On the leaves they occurred mixed with aestivating larvae of *P. testudinatus* (Thornton), but I soon learned how to separate these. The aestivating larvae of *granulatus* (fig. 7) show a different sclerotic pattern. There is no tortoise-like cover, but the sclerotic, pale, wrinkled tergum shows a median line and a suture between the pronotum and mesonotum; the borders between the head and pronotum and the other segments of the body are only in the middle indicated by short, rather indistinct sutures, which more laterally become completely invisible. In this the structure of the dorsum agrees with that figured for *Periphyllus negundinis* (Thomas) in Gillette & Palmer's admirable work on Colorado aphids (5), but they draw complete sutures between the head and pronotum, etc., though according to the description in contradistinction to *testudinatus* only the median two rows of dorsal plates are present, while the remainder of the dorsum is rugose, as in *granulatus*. At first I believed that these median plates were also present in the aestivating larvae of *granulatus*, but I soon saw, that what I believed to be the lateral bordering of these plates were the two main stems of the tracheae. In *granulatus* larvae there is no lateral border and no bordered rectangular plates are present on the abdomen. The shape of the foliate hairs around the body is somewhat different from that in aestivating larvae of *P. testudinatus*, as they are more pointed and narrower, particularly those on the front. Other differences are the long processus terminalis and the presence of very small but distinct siphunculi, seemingly on the VIth abd. segment.

The biology which at present is still very incompletely known, is similar to that of *P. testudinatus* (Thornton), but the aestivating larvae would seem to be rather superfluous in *granulatus*. For even on old trees there is a continuous reproduction of apterae viviparae going on, first on the undersides of the leaves and the flowerstems, later mainly on the fruitstems and on the fruits. Several of the apterae with foliate-haired embryos also contain some embryos

¹) I found nymphs in Sept. 1946 and reared one alata which has the same sclerotic pattern as those of *P. lyropictus* (Kessler). Its colour was green with a brown median line along dorsum. The tibiae are brownish yellow.

with normal hairs, and apterae with only long-haired larvae (fig. 8) are quite common all the time.

The discovery of this species and its aestivating larvae seems to make the use of the shape of the cauda for separating *Chaitophorus* from *Periphyllus* very illogical. And also a subdivision of *Periphyllus* via species without aestivating larvae and with aestivating larvae does not work, as the apterae more than any other species resemble *P. lyropictus*, without aestivating larvae, while its aestivating larvae are very much like those of the genotype, *P. testudinatus*.

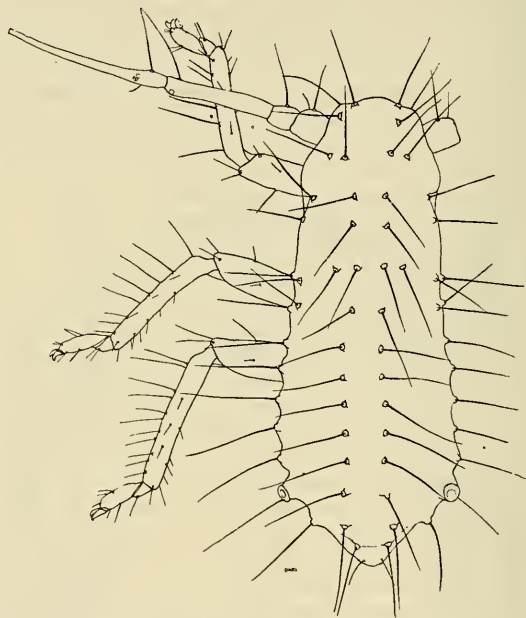


Fig. 8. *P. granulatus*, larve I of 3rd generation, dorsally, 78 \times .

5. *Periphyllus fuscus* (Börner) (3) (See also p. 228). In the Netherlands I have collected a *Periphyllus* on *Acer campestre* in Limburg, which in most regards agrees with Börner's description of *Chaetophorella fusca*, see p. 227. Its colour in life was dark mottled brown to blackish brown, and no aestivating larvae could be found. In macerated specimens the scleroites at the bases of the dorsal hairs are somewhat brownish pigmented, its other features are like *P. lyropictus* (Kessler), but the siphunculi are somewhat more pigmented than is customary for that species. The apterae have 5 or 6 hairs on the Vth ant. segment, while Börner says that *fusca* has 4. This character for separating *fusca* and *lyropictus*

is certainly of no value. For although Börner says that his *aceris* L. (our *lyropictus* Kessler) has 6—8 hairs on Vth ant. segment, an examination of typical material from *Acer platanoides* showed, that in *lyropictus* small specimens had 4 or more hairs, large ones 10 or less. Probably Börner has examined a few specimens only and this procedure has caused more discrepancies between his material and his descriptions as I have noted before. As also old specimens of *P. lyropictus* (Kessler) on *Acer platanoides* can be dark brown and no further differences between my material from *Acer campestre* and that from *A. platanoides* could be found I consider *Periphyllus fuscus* (Börner) a synonym of *lyropictus* (Kessler). Also Theobald and Vander Goot record *lyropictus* from both *Acer platanoides* and *A. campestre*.

6. *Periphyllus lichtensteini* nov. spec. Buckton (4) says that he received apterous males of *aceris* from Jules Lichtenstein. Some authors apparently did not believe this, though they offer no explanation. When examining some material from the Lichtenstein collection, now in the Museum at Budapest, I also examined apterous males of a *Periphyllus*, probably collected on *Acer monspessulanus*, and according to a note on the preparation black in colour. As no apterous males are known from European forms of this genus, it is probable that they represent a new species, unless they belong to *P. aceris rhenana* Börner, see p. 237. There were some oviparae, partly in the same preparations with the males, and from these it is evident, that the new species belongs near *aceris* (L.). Lichtenstein prepared his specimens between two slips of mica, with resin as mounting fluid. The mica is now weathered and opaque, but this can be surmounted by mounting the whole preparation, which is stored in a small envelope with central holes through which the insects can be examined, in balsam under a coverslip. The specimens are perfectly preserved. The oviparae are 1.50—1.90 mm long, elongated oval, with the posterior segments elongated into an ovipositor. The tergum shows rather few, long hairs, placed on distinctly dark sclerites; there are 2—4, mostly 2, spinal hairs on the anterior abd. segments, placed on two sclerites, 2 pleural hairs, each on a dark sclerite and some marginal hairs. The antennae are about $\frac{1}{2}$ — $\frac{3}{5}$ of body; the processus terminalis is only $1\frac{1}{2}$ —2 times as long as the base of last segment and the latter bears one long and one short hair as in *aceris* L., the longest hair much shorter than the basal part of last segment, but several times the largest diameter of that segment. Longest hairs on IIIrd ant. segment about 5—6 times its basal diameter. Siphunculi brownish to dark brown pigmented. Cauda broadly rounded, about twice as wide at base as long. Legs pale brownish, with dark apices to the tibiae only; hind tibiae swollen, with about 35 pseudosensoria of the shape which is typical for the genus. First tarsal joints with 5, 5, 5 hairs. The apterous males are much elongated, less than 1.60 mm long. Their dorsum is covered by rather

broad, long, sclerotic transverse bars, which are blackish pigmented. The antennae are about $\frac{5}{6}$ of the body; the IIIrd segment bears about 18—25 rhinaria, the IVth 7—12, the Vth 4—8 secondary rhinaria. Siphunculi dark. Legs pale with dark knees and dark apices to the tibiae. Other characters about as in the oviparous female.

As long as the viviparous forms and the aestivating larvae, if existing, are not known, the exact position of the species cannot be ascertained. The other European species have alate males, as far as their males are known.

Van der Goot (6) describes only three species from the Netherlands, but there are more. Wherever in this country I looked for *P. testudinatus* (Thornton) I easily found it. *P. aceris acericola* (Wlk.) also is not rare, but less common. Excepting Drente, where I did little collecting, this subspecies was found in all the provinces. *P. aceris aceris* (Wlk.) is not common, but where its host, *Acer platanoides*, is planted, it generally appears sooner or later. *P. lyropictus* (Kessler) is slightly less common than the preceding species, but it easily escapes detection. I found it only in the Southern half of the Netherlands. *P. granulatus* (Koch) has as yet only been found at Wageningen, and this is probably a really rare species. Re *P. fuscus* (Börner), collected at Geulhem in Limburg, see p. 240.

REFERENCES.

1. Baker, A. C., U.S. Dept. Agric., Bull. 826, 1920.
2. Börner, C., Arch. f. klass. u. phylog. Entomologie, vol. I, p. 126—127, 1930.
3. ———, Neue Blattläuse aus Mitteleuropa, ed. Börner, Naumburg, p. 1—4, 1940.
4. Buckton, G. B., Mono. Brit. Aphides, vol. II, 1879.
5. Gillette, C. P. & Palmer, M. A., Ann. Ent. Soc. America, vol. XXIV, p. 923, 1931.
6. Goot, P. v. d., Beiträge zur Kenntnis d. Holländ. Blattläuse, 1915.
7. Hille Ris Lambers, D., Stylops, London, vol. IV, p. 116, 1935.
8. Hoeven, J. v. d., Tijdschr. v. Entomologie, vol. VI, p. 1—7, 1863.
9. Kessler, H. F., Nova Acta K. Acad. Leop. Carol., vol. II, p. 151, 1886.
10. Koch, C. L., Die Pflanzenläuse Aphiden, livr. I, 1854.
11. Linné, C. v., Fauna Suecica, ed. II, p. 262, 1761.
12. Roberts, A. W. Rymmer, in Theobald, Aph. Great Britain, vol. III, p. 355—359.
13. Theobald, The Plantlice or Aphididae of Great Britain, vol. III, figs. 14, 16, p. 41, etc.
14. Thornton, J., Proc. Ent. Soc. London, n.s., vol. II, p. 68, 1852.
15. Wahlgren, E., Entomologisk Tidskrift, Stockholm, vol. LIX, p. 171, 1938.
16. Walker, F., Ann. Mag. Nat. Hist., ser. 2, vol. I, p. 448—451, 1848.